

What is claimed is:

- 1 1. A method of designing a set of wavelet basis, the method comprising:
2 constructing a neural network of arbitrary complexity using a discrete and finite
3 Radon transform;
4 designing an input wavelet to fit a particular problem;
5 feeding an input wavelet prototype designed to fit a particular problem through the
6 neural network and its backpropagation to produce an output; and
7 modifying an input function of the neural network using the output.
- 1 2. The method of claim 1 wherein constructing the neural network comprises
2 backprojecting the Radon transform to a point; and
3 subtracting a global average function of the point.
- 1 3. The method of claim 2 wherein the global average function is dependent on the
2 transform geometry and may be varied by varying the interconnect structure of the neural
3 network.
- 1 4. The method of claim 1 wherein the transform is dual to the network.
- 1 5. The method of claim 4 wherein the transform is weighted to a desired template
2 function.
- 1 6. The method of claim 1 wherein modifying the input function comprises subtracting
2 a difference between the input and the output from the input wavelet prototype and
3 moving the input function in the opposite direction from the difference so that the
4 difference converges to zero.

- 1 7. The method of claim 1 wherein a central equation for the Radon transform is
2 selected from the group consisting of a Gindikin equation or a Bolker equation.
- 1 8. The method of claim 1 wherein the wavelet bases are used to compress data
2 selected from the group consisting of images, multidimensional data, or spatiotemporal
3 data.
- 1 9. The method of claim 5 wherein the template function is a sphere.
- 1 10. A system for designing a set of wavelet basis, the system comprising:
2 means for constructing a neural network of arbitrary complexity using a discrete
3 and finite Radon transform;
4 means for designing an input wavelet to fit a particular problem;
5 means for feeding an input wavelet prototype designed to fit a particular problem
6 though the neural network and its backpropagation to produce an output; and
7 means for modifying an input function of the neural net using the output.
- 1 11. A computer readable medium comprising instructions, which when executed on a
2 processor, perform a method of designing a set of wavelet basis, the method comprising:
3 constructing a neural network of arbitrary complexity using a discrete and finite
4 Radon transform;
5 designing an input wavelet to fit a particular problem
6 feeding an input wavelet prototype designed to fit a particular problem through the
7 neural network and its backpropagation to produce an output; and
8 modifying an input function of the neural net using the output.
- 1 12. An apparatus for designing a set of wavelet basis, the apparatus comprising:

2 a neural network constructor that uses a discrete and finite Radon transform to
 3 construct a neural network of arbitrary complexity;
 4 a designing module to design an input wavelet to fit a particular problem, the
 5 designing module coupled to the neural network constructor;
 6 a feeder to feed an input wavelet prototype designed to fit a particular problem
 7 through the neural network and its backpropagation to produce an output, the feeder
 8 coupled to the designing module; and
 9 a modifier module to modify an input function of the neural net using the output,
 10 the modifier module coupled to the feeder.

1 13. The apparatus of claim 12 wherein the neural net constructor is configured to
 2 backproject the Radon transform to a point and to subtract a global average function of the
 3 point.

1 14. The apparatus of claim 13 wherein the global average function is dependent on the
 2 transform geometry and may be varied by varying the interconnect structure of the neural
 3 network.

1 15. The apparatus of claim 12 wherein the transform is dual to the network.

1 16. The apparatus of claim 15 wherein the transform is weighted to a desired template
 2 function.

1 17. The apparatus of claim 12 wherein the modifier module is configured to subtract
 2 the difference between the input and the output from the input wavelet prototype and
 3 move the input function in the opposite direction from the difference such that the
 4 difference converges to zero.

1 18. The apparatus of claim 12 wherein a central equation for the Radon transform is
2 selected from the group consisting of a Gindikin equation or a Bolker equation.

1 19. The apparatus of claim 12 wherein the wavelet bases are used to compress data
2 selected from the group consisting of images, multidimensional data, or spatiotemporal
3 data.

1 20. The apparatus of claim 16 wherein the template function is a sphere.

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